

**Seed production of perennial ryegrass:
dates and methods of seeding**

by

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Introduction

In Atlantic Canada perennial ryegrass (*Lolium perenne* L.) is a short term perennial grass species commonly grown in mixtures with legumes and grasses for pasture or for silage. Inflorescence development of perennial ryegrass requires dual induction including cool temperatures (3-10°C) and short days for 12 to 16 weeks in the fall. Seed development of perennial ryegrass takes place during the long days of the following growing season. Overwintering conditions are stressful on overwintering perennial ryegrass plants as death occurs at temperatures between 12 to 18 °C (LT_{50}) depending on cultivar. Management strategies that enhance survival of overwintering plants are important in developing seed production of perennial ryegrass in PEI. Cost saving and environmentally sound methods of establishment are also important. The aims of this research were to assess effects of seeding dates and methods of establishment on persistence and seed production of Norlea perennial ryegrass.

Materials and methods

The field experiments were conducted at the Crops and Livestock Research Centre in Charlottetown, Prince Edward Island. The soil was a fine sandy loam with a pH of 6.0 to 6.2. Fertilizer P and K were applied according to soil test results to maintain medium to high fertility levels of soil.

The plot size was 2 * 5 m. Perennial ryegrass cv. Norlea was sown at 10 kg/ha of viable seed. Barley cv. Chapais was sown at 115 kg/ha (250 seeds/m²) with ryegrass and at 160 kg/ha (350 seeds/m²) when barley was sown alone. Row space was 20 cm.

The times and methods of seeding were:

<u>Trt.</u>	<u>Mid-May seeding</u>
1	Perennial ryegrass (PR) seeded alone in cultivated seedbed
2	PR + barley, cut barley for silage
3	PR + barley, harvest barley for grain
	<u>Mid-August seeding</u> [after barley grown & harvested for silage]
4	PR seeded in cultivated seedbed
5	PR direct drilled into barley stubble
6	PR seeded into worked stubble (surface residue)
	<u>Early September seeding</u> [after barley grown & harvested for grain]
7	PR seeded in cultivated seedbed
8	PR direct drilled into barley stubble
9	PR seeded into worked stubble (surface residue)

Times and rates of fertilizer application were:

<u>Seeding year</u>		
17-17-17	400 kg/ha	mid-May
15-5-15	300	mid-August
<u>Production years</u>		
17-17-17	500	early May
15-5-15	300	mid-August

Before harvest plants were cut at ground level in two 50 cm segments of outside row on each plot for determining number of fertile tillers. Spikelets per tiller were determined in 10 random tillers.

Perennial ryegrass was clipped when seed moisture content was 39 to 43 %. The harvested material was placed in jute bags and air-dried in 1998 and 1999. In 2000 forced air drying was used to reduce drying

time. About two months after harvest the dried ryegrass was threshed and cleaned. Germination and thousand seed weights were determined according to procedure of the International Seed Trade Association. Experimental design was a split-plot with seeding dates in main plots, methods of seeding in sub-plots and replicated four times.

Results

Three year means are presented in Tables 1 and 2. In general, wintersurvival of perennial ryegrass was good and it was possible to harvest seed crop in three consecutive years. It is noted that overwintering conditions were quite favorable during the experimental period. The key findings in this study were:

- Seed yields (Table 1) were 8 to 12 % higher for seeding in early May than in mid-August or early September. The conventional, no-till and residue till methods resulted in similar seed yields.
- Regrowth herbage yields were not influenced by the seeding date or method of seeding.
- Method of seeding and seeding date did not influence tiller density but spikelet numbers per tiller were lowest for the May seeding.
- Germination and thousand seed weight were slightly lower for the residue till than no-till or conventional seeding methods.
- In herbage regrowth both ADF and NDF concentrations were greatest for the residue till method but crude protein was not influenced by the treatments.
- Mineral composition of herbage in regrowth appears in Table 2. In general, treatments had little or no effect on mineral composition.

Conciusion

Wintersurvival of Norlea perennial ryegrass was good. Protected fields with good drainage should enhance wintersurvival of perennial ryegrass. The results suggest that perennial ryegrass can be sown either in the spring or in late summer by the first week in September. Conventional and reduced tillage methods can be used in the establishment of perennial ryegrass. Growers have thus a wide range of options to establish perennial ryegrass for seed and conservation purposes. Seed yields of about 1000 kg/ha suggest that seed production can be financially viable in most years. Regrowth herbage yields provide quality feed for late season grazing or biomass for maintaining soil resource.

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Table 1. Seed and herbage regrowth yields, tiller density, spikelet number, germination, 1000-seed weight of perennial ryegrass, and concentrations of crude protein, neutral detergent fibre and acid detergent fibre in regrowth, three year means.

	Seed ² kg ha ⁻¹	Tillers m ⁻²	Spikelets tiller ⁻¹	Germination %	TSW g	Regrowth kg ha ⁻¹	Crude protein g kg ⁻¹	NDF g kg ⁻¹	ADF g kg ⁻¹
Date of seeding									
May	1183	1444	20.5	85.1	1.47	1824	31.2	567.7	291.4
August	1095	1584	21.5	84.6	1.44	1780	31.6	558.5	288.3
September	1060	1454	21.3	83.9	1.43	1758	31.4	564.3	287.4
sem (n=36, 18 df)	34.0	64.6	0.26	0.78	0.03	61.0	0.30	4.1	3.4
Method of seeding									
Cultivated	1095	1397	20.9	86.0	1.48	1792	31.5	555.7	281.3
No-till	1119	1494	20.9	85.3	1.47	1730	31.5	562.1	291.2
Residue till	1124	1592	21.4	82.3	1.40	1841	31.2	572.6	294.7
sem (n=36, 53 df)	19.3	58.5	0.28	0.85	0.02	48.9	0.31	3.7	2.9

² 14 % moisture

Table 2 . Mineral composition in regrowth herbage of perennial ryegrass , three year means

	Ca %	Mg %	Na %	P %	K %	S %	Cu ppm	Zn ppm	Mn ppm	Fe ppm	B ppm
Date of seeding											
May	0.63	0.22	0.050	0.46	2.50	0.27	8.16	20.7	152	76.4	3.77
August	0.62	0.21	0.055	0.46	2.67	0.28	8.14	20.4	141	79.3	3.68
September	0.64	0.21	0.051	0.46	2.65	0.29	8.39	21.6	160	80.8	3.80
sem (n=36, 18 df)	0.009	0.003	0.001	0.006	0.056	0.005	0.111	0.354	3.80	2.20	0.093
Method of seeding											
Cultivated	0.62	0.21	0.052	0.46	2.66	0.29	8.34	21.4	157	81.7	3.74
No till	0.64	0.21	0.053	0.46	2.64	0.28	8.27	20.9	150	77.5	3.71
Residue till	0.64	0.21	0.051	0.46	2.52	0.28	9.08	20.3	146	77.3	3.79
sem (n=36, 53 df)	0.009	0.003	0.001	0.005	0.038	0.004	0.088	0.235	3.41	1.79	0.071

